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On Plucker equations characterizing Grassmann cones. (English) Zbl 1387.14127


From the introduction: This survey article, which may also serve as background material while reading, for instance, [E. Arbarello, Contemp. Math. 312, 9–69 (2002; Zbl 1056.14023), Section 4] and parts of [M. Mulase, Perspectives in mathematical physics. Proceedings of the conference on interface between mathematics and physics, held in Taiwan in summer 1992 and the special session on topics in geometry and physics, held in Los Angeles, CA, USA in winter of 1992. Boston, MA: International Press. 151–217 (1994; Zbl 0837.35132), M. Sato, Random systems and dynamical systems, Proc. Symp., Kyoto 1981, RIMS Kôkyûroku 439, 30–46 (1981; Zbl 0507.58029)], has the purpose to advertise the notion of Schubert derivation on an exterior algebra, introduced by the first author [Asian J. Math. 9, No. 3, 315–322 (2005; Zbl 1099.14045)] (see also the authors [Hasse-Schmidt derivations on Grassmann algebras. With applications to vertex operators. Cham: Springer (2016; Zbl 1350.15001)]), by showing how it provides another approach to look at the quadratic equations describing the Plücker embedding of Grassmannians – a very classical and widely studied subject.

In particular, it allows i) to “discover” the vertex operators generating the fermionic vertex superalgebra (in the sense of [S. Galkin and D. Ben-Zvi, Lond. Math. Soc. Lect. Note Ser. 308, 46–97 (2004; Zbl 1170.17303), Section 5.3]); ii) to compute their bosonic expressions as by V. G. Kac et al. [Bombay lectures on highest weight representations of infinite-dimensional Lie algebras. 2nd ed. Hackensack, NJ: World Scientific (2013; Zbl 1294.17021), Lecture 5]; iii) to interpret them in terms of Schubert derivations and iv) to provide an almost effortless deduction of the celebrated Hirota bilinear form of the KP hierarchy (after Kadomtsev and Petviashvili) [Kac et al. loc. cit.].

For the entire collection see [Zbl 1382.14002].

MSC:

14M15 Grassmannians, Schubert varieties, flag manifolds
14N15 Classical problems, Schubert calculus
13N15 Derivations and commutative rings

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